FLOOD PLAIN MANAGEMENT STUDY

BANKS COUNTY, GEORGIA

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE MARCH 2004

FLOOD PLAIN MANAGEMENT STUDY

BANKS COUNTY, GEORGIA

Prepared By

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
ATHENS, GEORGIA

In Cooperation With

BROAD RIVER SOIL AND WATER
CONSERVATION DISTRICT

MARCH, 2004

FLOOD PLAIN MANAGEMENT STUDY
BANKS COUNTY, GEORGIA

INTRODUCTION

The Banks County Board of Commissioner's, recognizing the need for detailed flood hazard information, requested a flood plain management study (FPMS) late in 1998. Work on the study commenced in February 1999. There are approximately 76 miles of stream included in this study.

The Board of Commissioner's requested a FPMS in order to obtain detailed information for use in developing an effective flood plain management program. The Broad River Soil and Water Conservation District (S&WD), as co-sponsor, forwarded the request to the Natural Resources Conservation Service (NRCS).

Banks County provided assistance throughout the study, which included providing public information and some monetary remuneration, and acquiring access permits for field surveys. The Broad River S&WCD assisted in the public information program.

NRCS assists State agencies and communities in the development and implementation of their flood plain management programs by carrying out cooperative flood plain management studies under authority of Section 6, Public Law 83-566. Studies are made in accordance with Executive Order 11988 and Federal Level Recommendation 5(b) of "Unified National Program for Flood Plain Management."

Field surveys of valley cross sections and road crossings represent conditions as of 1999. Peak discharges were computed using U.S. Geological Survey regional regression equations. Flood profiles have been computed using the HEC RAS computer program.

STUDY AREA DESCRIPTION

Banks County is located in the northeastern part of Georgia. The Georgia counties sharing boundaries with Banks are Hall to the west, Jackson and Madison to the south, Franklin to the east, and Habersham and Stephens to the north. Homer, the county seat, is located in the central part of the county and about 75.3 miles northeast of Atlanta.

The mean annual temperature is 73 degrees Fahrenheit, varying from a mean of 34 degrees in January to 67 degrees in July. The average freeze-free period is approximately 220 days extending from late April to late October. Precipitation averages 59 inches annually and varies from 3.3 inches in October to 6.7 inches in March.

NATURAL VALUES

The area of study includes Grove River (includes named tributaries: Crooked Creek and Hickory Level Creek), Hudson River (includes named tributaries: Webb Creek and Holbrook Creek), Carlan Creek and Nails Creek in Banks County.

Flood plains that have not been altered for agricultural or urban uses support some very valued productive and diverse biota that is adapted to alternating high and low water flows that may occur on a regular cycle. Additionally, flood plains provide areas where floodwaters can spread out to be temporarily stored, thereby reducing downstream flooding. This reduces flood peaks and the resulting flood velocities that can cause erosion and property damage.

Flood plains maintain or improve water quality in streams and reservoirs. A vegetated flood plain slows surface runoff, causing it to drop most of its sediment load on the valley floor. This filtering process adds nutrients to flood plain soils that are retained within the flood plain limits by the vegetation, biotic life, and/or wetlands that are present. However, when this vegetation is removed, excessive nutrients will be allowed to enter the stream from runoff, thereby accelerating stream pollution and eutrophication of downstream reservoirs. In summary, natural flood plains have surface conditions, which favor local ponding and floodwater detention, and subsurface conditions that favor infiltration and storage. Thus, flood plains serve an important role in ground water recharge during low flow periods to the streams.

FLOOD POTENTIAL

The potential for flooding exists along all streams in the study area. As in the past, the potential for future flood damage is largely due to agricultural land, roads, and bridges. However, if the recent trend to build homes and other buildings within flood plains continues, the potential for non-agricultural flood damages will greatly increase.

EXISTING FLOOD PLAIN MANAGEMENT

Banks County has adopted an erosion and sediment control ordinance. Any major land disturbing activity must receive a permit. Permits are not issued until the developer has an adequate erosion control plan designed. These plans are reviewed by the Natural Resources Conservation Service on behalf of the Broad River Soil and Water Conservation District for technical feasibility and concurrence with accepted erosion control standards. Procedures for carrying out the ordinance comply with provisions of the Georgia Erosion and Sedimentation Control Act.

FLOOD PLAIN MANAGEMENT ALTERNATIVES

Proper management of the flood plain can minimize flood damages in most flood hazard areas. Several alternatives are available which could be implemented by the County to improve management of the flood plains. The alternatives are discussed in this section.

Land Treatment

Vegetation protects the soil from the impact of raindrops, and the root system binds the soil, thus reducing erosion. Conservation land treatment practices can be applied to reduce sediment delivery to stream channels. Adequate vegetative cover reduces runoff and erosion by allowing rainfall to penetrate open spaces around roots and to be absorbed by plant roots. Additional water is stored in the later of humus formed by decaying organic matter. Some of this water is put into the atmosphere by plant transpiration, thus reducing runoff.

Many of the sediment producing areas in the study area are unpaved roads and jeep trails, many on very steep slopes, and road banks. Other sediment producing areas are idle land and abandoned pastures. Application of the proper management practices (e.g., tree and grass planting, lime and fertilizer application) may reduce runoff and sediment from these areas.

Sediment deposited in the stream reduces channel capacity, thereby increasing the amount of flooding. The current ordinances regarding erosion and sediment control have been an important means for controlling sediment from new construction sites. As construction accelerates, it will become more important to enforce these ordinances in order to minimize the amount of sediment reaching the streams.

As the uplands change from agriculture and forest to more urban uses, the ensuing concentration of buildings, paved parking lots, roads, and other impervious surfaces will increase the amount and rate of runoff. This will result in more severe flooding in the flood plain. Wise land use management of the uplands can be an important step toward controlling flooding on the lowlands.

Non-structural Measures

Non-structural measures are flood protection measures that are usually applied to individual buildings. This differs from the conventional structural flood protection such as dikes and dams which are commonly designed to protect groups of buildings. Non-structural measures include land use regulations, flood insurance, flood proofing, relocation, and flood warning systems. They may be used to alleviate the impact of existing flooding and to reduce susceptibility to future flooding. Most likely, a combination of measures will be necessary to achieve the desired results.

Flood proofing can be used for existing structures in the flood plain as well as for new construction. It consists of raising buildings above the 100-year flood elevation. Existing buildings can be jacked up and foundations and plumbing extended. Relocation may be more practical for some homes and mobile homes. Each could be moved a short distance to a site which would be higher that the 100-year flood.

Land use regulations can be used to effectively reduce future susceptibility. By providing direction to growth and change, regulations are well suited to preventing unwise flood plain occupancy. Wise land use should also be applied to areas other than flood plains. Increased rates of runoff caused by impervious surfaces such as parking lots, roads, and roofs can cause more frequent and severe flooding.

Banks County is currently enrolled in the Regular Flood Insurance Program and realizes the importance of detailed flood data to the implementation of an effective flood plain management program. The detailed flood plain data presented in this report will provide a basis for such a program.

The flood hazard photomaps, which can be found on the CD, can be used to identify the 100-year and 500-year flood hazard areas. Flood profiles for the 10-year, 50-year, 100-year and 500-year floods are presented in the report as well as in Adobe format on the CD. Also shown are the locations of surveyed cross sections and road crossings.

To determine the flood hazard at a specific site, the following procedure is suggested.
1. Located the site on the appropriate photomap sheet.
2. Scale the distance from the site to the nearest cross section.
3. Locate the cross section on the appropriate flood profile sheet then plot the questioned site at the appropriate scaled distance from the cross section. Flood elevations at the site can now be read from the flood profiles.

The mean sea level (MSL) elevation of the site should be determined by an acceptable survey procedure. Elevation reference marks (bench marks) are shown on the individual maps on the CD and are described in this report.

Preservation of Natural Values

Serious consideration should be given to preservation of wetlands, unique areas, undeveloped flood plains, and bluffs adjacent to the streams which have high values for education, recreation, natural water treatment, ground water recharge, and moderation of floods. Preservation of archaeological and historical sites should be considered an important part of land use planning.

The flood plain moderates flooding by providing an area where floodwater can spread out and be temporarily stored. Vegetated flood plains slow the rate at which incoming overland flow reaches the channel. Practices such as clearing, compacting, paving, filling, and building within the flood plain can cause increased flood elevations and frequencies. The adverse impact of this increased flooding must be considered. By maintaining the natural floodwater carrying capacity of the flood plain, many future flood problems may be avoided.

Encouragement of stream corridors or greenbelts along both sides of rivers and streams, particularly areas used for urban, pasture, and crops, will help reduce sediment loads. The greenbelts or stream corridors should be 50 to 100 feet wide landward from the top of each stream bank. This would maintain riparian vegetation, prevent stream bank erosion and collapse, avoid accelerated sedimentation of the creeks, and maintain habitats for living resources—particularly fish and wildlife.

INVESTIGATIONS AND ANALYSES

Survey Procedures

Desktop Mapping System software (DMS) was used to create cross sections from orthographically corrected high resolution digital stereographic pairs. Correction was obtained using control points established by the NRCS in cooperation with the Center for Remote Sensing and Mapping Science at the University of Georgia. Groupings of cross sections through out the study area were ground truthed utilizing GPS and were found to be within the necessary $\pm$ 1 foot accuracy. Cross sectional information for the Grove River and portions of the Hudson River were originally obtained using traditional ground survey methods. Cross sections for these areas were also developed in DMS as another verification of accuracy. When traditional survey data was available it was used in the model.

All roads and bridges were surveyed by NRCS staff using benchmarks established with GPS. GA-DOT bridge inspection reports and as-built plans showing dimensions of bridges were obtained for many sites and used for verification purposes.

Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the 10-year, 50-year, 100-year, and 500-year recurrence intervals. Peak discharges for the study reaches, with the exception of Grove River, were developed using U.S. Geological Survey regional regression equations. A HEC-HMS model was developed for the Grove River. This model evaluated the impact of six NRCS flood control structures on the drainage basin.

Hydraulic Analyses

Elevation-discharge relationships were established using the U.S. Army corps of Engineers computer program HEC-RAS. The solutions consist of backwater computations based on Bernoulli's equation for the total energy at each cross section and Manning's formula for the friction head loss between cross sections. Manning's roughness coefficients ("n" values), which represent the characteristics for the channel and overbank areas, were based on aerial photography and field investigation. Once modeling for each stream was complete, a Check-RAS report was generated to look for common errors. All errors and warnings were identified and addressed as needed.

Water surface elevations at road crossing structures were computed assuaging unobstructed flow conditions. No consideration was made of openings blocked by debris, future flood plain filling, or other encroachments which could increase flood stages. Selected water surface elevations were tabulated and are provided as a part of this report. Profile plots were created with the assistance of FEMA's RAS-Plot software.

The delineated flood hazard area limits are the irregular lines conforming to the area subject to inundation by the 100-year and 500-year floods as shown on the hardcopy plots and Arcview shapefiles, and Adobe files found the CD. The 100-year and 500-year flood hazard area widths coincide respectively with the computed 100-year and 500-year surface profiles at cross-section locations. Delineations of flood hazard areas between cross sections were made using U.S.G.S. digital orthophoto quarter quadrangles as well as digital U.S.G.S. 7.5 minute quadrangle sheets as base maps in AutoCAD Map.

GLOSSARY OF TECHNICAL TERMS

Cross Sections (stream or valley) – The shape of a channel, stream, or valley, viewed across the axis. In this study, it is determined by a line approximately perpendicular to the main path of water flow, along which measures of distance and elevation are taken to define the cross sectional area.

Drainage Area – The area draining into a stream at a given point. The area may be different for surface runoff, subsurface flow, and base flow, but generally the surface runoff area is used as the drainage area.

Flood Crest – The maximum stage or elevation reached by the waters of a flood at a given location. The discharge at this stage would be the peak discharge.

Flood Plain – The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

Flood Hazard Area – Same as flood plain.

Flood Profile – A graph showing the relationship of water surface elevation to location, the latter often expressed as distance above the mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevations for the crest of a specific flood.

Frequency or Recurrence Interval – a measure of how often a hydraulic event of given size or magnitude should, on an average, be equaled or exceeded. For example, a 100-year frequency flood should be equaled or exceeded in size, on the average, once in 100 years. However, this event could take place during any year. In terms of percent chance this event is called the 1 percent chance of occurring in any given year.

REFERENCES

1. U.S. Department of the Interior, Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000.

2. U.S. Department of the Interior, Geological Survey, Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins of Georgia, 1993.

3. U.S. Department of the Interior, Geological Survey, Water Resources Data for Georgia.

4. U.S. Department of the Interior, Geological survey, Floods in Georgia, Magnitude and Frequency, October 1979.

5. U.S. Department of the Interior, Geological survey, Office of Water Data Coordination, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, March 1982.

6. U.S. Army Corps of Engineers HEC-RAS Version 3, User's and Reference Manuals, 2001.

7. U.S. Department of Agriculture, NRCS, National Engineering Handbook, Section4, Hydrology.

8. National Oceanic and Atmospheric Administration, National Climate Data Center, Climatological Data – Georgia.

9. Federal Emergency Management Agency, Flood Insurance Study Guidelines and Specifications for Study Contractors, FEMA 37, 1995.

10. CheckRAS and RASPlot software and users manuals, FEMA website.

14. John, Lawrence R., "Values of Riparian Habitats to Natural Ecosystems", Proceedings of the Symposium, Strategies for Protection and Management of Flood Plain Wetlands and Other Riparian Ecosystems, Callaway Gardens, Georgia, 1978.